

July 15, 1941.

M. ESSL

2,249,628

INTERNAL COMBUSTION ENGINE LOCOMOTIVE

Filed Feb. 27, 1939

2 Sheets-Sheet 1

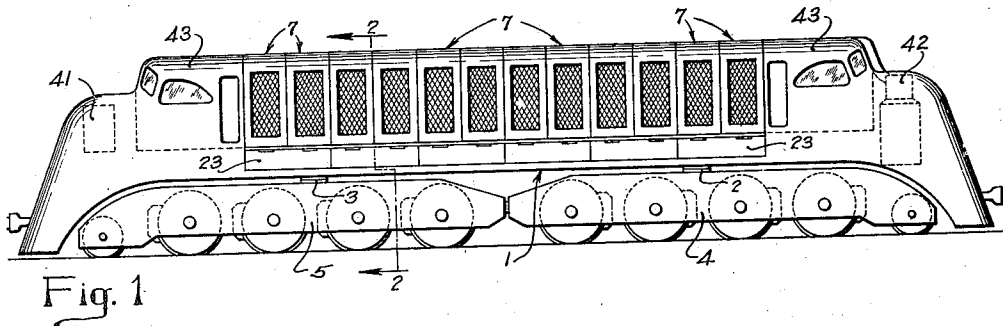


Fig. 1

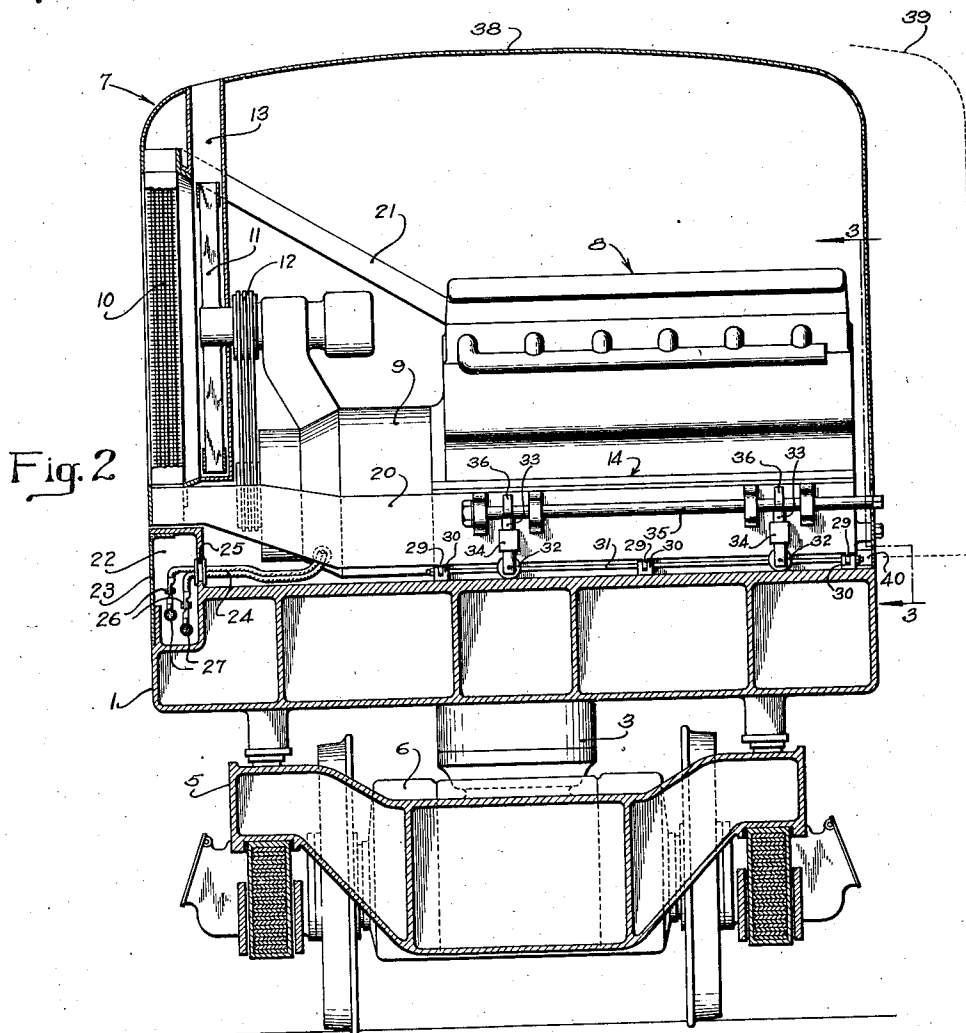


Fig. 2

INVENTOR
MAX ESSL

BY *Edward M. Conway*
ATTORNEY

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2 Sheets-Sheet 2

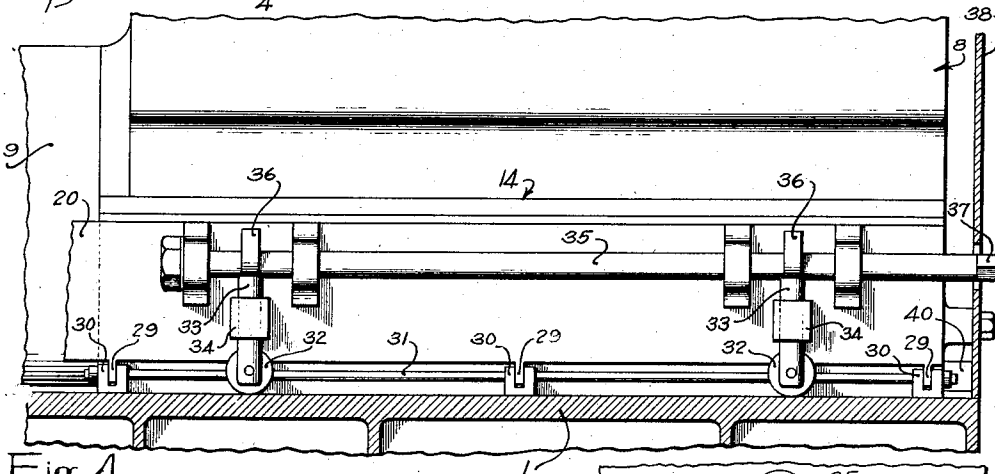
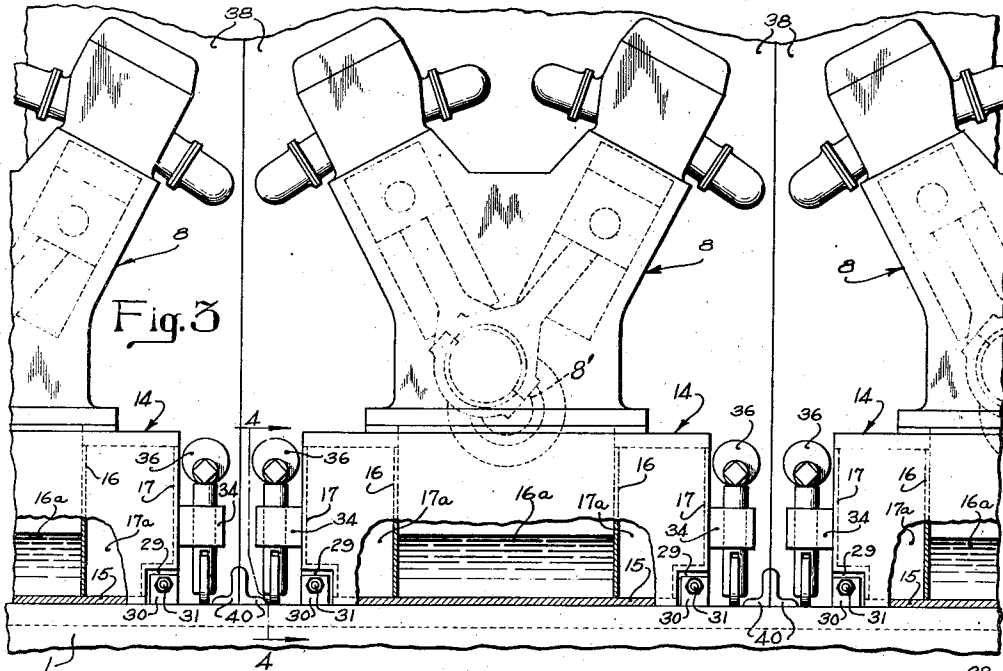


Fig. 4

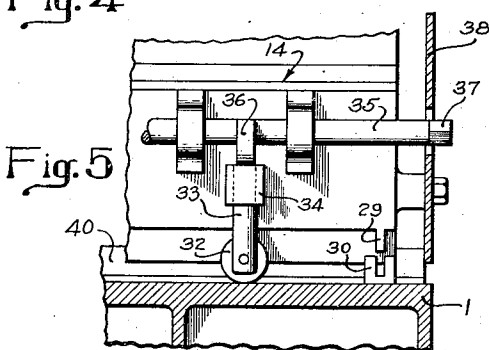


Fig. 5

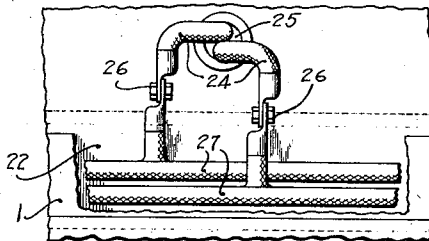


Fig. 6

INVENTOR
MAX ESSL

BY *Edward M. Conway*
ATTORNEY

UNITED STATES PATENT OFFICE

2,249,628

INTERNAL COMBUSTION ENGINE
LOCOMOTIVE

Max Essl, Norwood, Pa., assignor, by mesne assignments, to The Baldwin Locomotive Works, a corporation of Pennsylvania

Application February 27, 1939, Serial No. 258,689

20 Claims. (Cl. 105—35)

This invention relates generally to locomotives and more particularly to high powered Diesel electric locomotives.

High powered Diesel locomotives such as are now being used for high speed passenger service or those proposed to be used for main line freight service are subject to several objections, one of which is that the complete locomotive equipment is excessively long, so much so that it has been found necessary to provide two or more separate locomotive units coupled together. Another objection is the high initial cost which is due, in part, to the excessive structure necessary for locomotives of great length, while a further very serious objection is the necessity for taking a locomotive unit completely out of service when an engine thereof must be repaired.

It is an object of my invention to provide an improved locomotive that is particularly adapted for high powered operation while maintaining the entire locomotive equipment within such a compact length that only a single locomotive unit is required.

Another object is to provide an improved Diesel electric locomotive adapted for large power for a given length and to have the power generating equipment so arranged that in the event of engine trouble it will not be necessary to remove the locomotive from service during repair of an engine. In prior arrangements the locomotive units usually employ two or more engines so arranged and related to the locomotive as to require removal from service of the entire locomotive unit even though only one engine must be repaired.

Other objects and advantages will be more apparent to those skilled in the art from the following description of the accompanying drawings in which:

Fig. 1 is a side elevation of my improved locomotive;

Fig. 2 is a transverse section taken substantially on the line 2—2 of Fig. 1 to show one of the engine generator power units;

Fig. 3 is an enlarged fragmentary side elevation of the engine units taken substantially on the line 3—3 of Fig. 2, certain parts being omitted for sake of clarity;

Fig. 4 is a transverse section taken substantially on the line 4—4 of Fig. 3 to show one form of mechanism for removing one of the engine units;

Fig. 5 is a fragmentary side elevation of the mechanism shown in Fig. 4 in a position for removing an engine unit;

Fig. 6 is an enlarged side elevation of the electrical connections between the engine generators and the main bus leading to the electric motors.

In the particular embodiment of the invention, such as is disclosed herein merely for the purpose of illustrating one specific form among possible others that the invention might take in practice, I have shown in Fig. 1 a diagrammatic outline of my improved locomotive having a single bed frame 1, of any suitable and usual construction, mounted through suitable center pin structures 2 and 3 on preferably articulated driving wheel units 4 and 5, although it will, of course, be understood that under certain conditions a single driving wheel unit may be employed if desired, such as is particularly true for switching locomotives and other small powered locomotive equipment. The driving wheel units 4 and 5 do not per se constitute a part of my present invention and hence detailed description and disclosure thereof is not necessary, except to point out that usual electric motors 6 are suitably supported in the driving units for actuating the driving wheels.

To provide a locomotive of large power in a given length while still avoiding the necessity of removing the whole locomotive from service in case it is necessary to repair one engine, I have provided a series of self-contained power units 7 arranged transversely of the bed frame 1, each unit including a transversely disposed engine 8 having a generator 9 and a radiator 10 suitably connected in any usual manner to the water cooling jackets of the engine. The engine is generally of the vertical type wherein the cylinders are arranged in either a simple vertical manner or in a V-form, the V-form of engine being preferable in order to utilize all available space although it will, of course, be understood that under certain circumstances the simple vertical type engine can be employed, but in either case the engines are disposed so that the axis of each, i. e. the crankshaft axis, extends transversely of the locomotive frame. The engine crankshaft is generally indicated at 8', Fig. 3. A blower 11 is suitably driven from the engine by belts and pulleys 12 and is arranged preferably to draw air inwardly over the radiator 10 and discharge the same vertically through a passage 13. As is seen from the relative proportions of the power units in Figs. 1 and 2, the width of said units is such that when they are placed in side by side relation the total space occupied by any two adjacent power units in a direction lengthwise of the bed frame is materially less than the sum of the

individual lengths of the units even though limited spacing occurs between the units longitudinally of the bed frame. It is desirable in this arrangement to have the engines located at the same side of the bed frame.

To provide a suitable supporting structure for the foregoing self-contained engine-generator unit, the engine can be of the type having a bed frame 14, Fig. 3, which is provided with a bottom plate 15 and a series of vertical partitions 16 and sides 17. An engine lubricating oil sump 16a is provided between partitions 16 while storage battery compartments 17a are formed between walls 16 and 17. The side plates 17, as shown in Fig. 2, are continued as at 20 to provide arms for supporting radiator 10. A suitable brace 21 may also extend from the radiator to the engine. The outer ends of arms 20 overlie a longitudinal passage or wiring compartment 22 formed as a part of and preferably integrally with the bed frame 1. Said passage extends above the plane of the upper surface of the bed frame and also extends along the length of the entire bank of power units 7 as shown in Fig. 1. A hinged door or series of doors 23 permit access to said passage. Wires 24 from each of the generators 9 extend through enlarged openings 25 in the rear wall of passage 24 adjacent each power unit and then downwardly for connection as at 26 to main motor wires 27 which run lengthwise within passage 22 and are suitably connected through usual controlling equipment to the driving motors. Each power unit can have any usual and well-known safety devices (not shown) for independently shutting down the units in the event of engine trouble arising from well-known causes.

The power units as described are transversely placed closely adjacent to each other in side by side relation to provide not only for maximum power in a minimum of space as previously pointed out but also to provide a smooth continuous appearance of the entire locomotive. The foregoing is also conducive to having each engine unit suitably removably secured to and supported by the upper surface of bed frame 1 whereby any individual engine unit may be bodily removed in a simple and efficient manner in case it is necessary to make repairs thereto and in addition all of the units are removed in a uniform manner. A substitute engine unit may be inserted while repairs are being made on the removed unit. This will permit the locomotive equipment to be maintained in service with minimum delay and without causing the useful engines to be removed from service such as is now necessary with multiple engine units wherein all of the engines are formed as a rigid normally inseparable part of the locomotive. Inasmuch as the power units are identical as heretofore described, they are therefore interchangeable.

To hold the power units in position, I have provided, Fig. 4, a series of vertical lugs 29 connected to the lower transverse edges of the engine base 14. The term "transverse" has reference to the locomotive bed, although with respect to the engine itself the lugs 29 are disposed along the longitudinal edges thereof. Formed integrally with or otherwise connected to the bed frame 1 are slotted posts 30 adapted to receive the lugs 29. Aligned holes through the lugs and posts permit a holding bar 31 to be inserted therethrough and suitably bolted therein, these holding rods being disposed along each side of

the engine as shown in Fig. 3. To remove the power unit, it is first necessary to lift the same upwardly to disengage lugs 29 from posts 30 and thereafter laterally remove the unit. Broadly, each unit is movable in a plane containing the engine axis and extending at substantially right angles to the longitudinal axis of the locomotive bed frame. One form among other possible mechanisms for accomplishing this in a simple and effective manner is to provide a series of rollers 32 journaled in push rods 33 which are vertically slidably supported in guides 34. These guides are secured to the sides 17 of the engine base. A shaft 35 is provided with cams 36 for engaging the push rods 33 whereby upon rotation of rod 35 at its outer squared end 37 it is possible to force rollers 32 into engagement with the top supporting surface of bed frame 1 and to bodily lift the power unit so as to free lugs 29 and posts 30 whereupon the unit may be laterally wheeled off of the engine bed and on to a suitable platform. A new unit may be then moved into position on its rollers and lowered so as to be fastened by rods 31. To provide a suitable guideway for the rollers 32, a series of transverse angle irons 40, Fig. 3, may be secured to the locomotive bed frame. Removal of a unit in the manner aforesaid simply requires disconnection of connectors 26, Fig. 2, from the main motor conduits 27 whereby the leads 24 will pass freely through the openings 25. Also, the hood 38 of each unit is formed preferably as a rigid part thereof and hence this hood moves with the power unit as shown in dotted lines 39, Fig. 2. The hoods of successive units are disposed in substantially contiguous relation to each other thereby forming the external roof and wall portions of the locomotive.

From the foregoing disclosure, it is seen that I have provided a Diesel locomotive arrangement that is adapted to produce tremendous power for a given minimum overall length of locomotive structure and at the same time I avoid having the entire locomotive stand by idly when repair to only one engine is required. In a relatively simple manner it is possible to remove the disabled power unit and substitute another one very quickly thereby permitting the locomotive together with its operative engines to remain in service. It will, of course, be understood that any of the accessory apparatus such as air compressors, heating boilers, etc. may be incorporated in a usual manner, although as shown herein such accessory devices, diagrammatically indicated at 41 and 42, are located in the forward and rear body structure adjacent cabs 43. As is seen from the specific arrangement herein disclosed, the upper surface of the bed frame upon which the power units are supported extends not only substantially continuously between the cabs 43 as shown in Fig. 1 but also extends a substantial distance across the width of the frame as shown in Fig. 2 whereby a practically unobstructed "flat car" effect is presented by the main bed frame 1 when the power units are entirely removed therefrom, or conversely, when the power units are transversely placed in position as shown in Fig. 1 they form a longitudinally compact bank of power units extending continuously in substantially contiguous relation to each other and to the cabs 43.

It will of course be understood that various changes in details of construction and arrangement of parts may be made by those skilled in the art without departing from the spirit of the

invention as set forth in the appended claims.

I claim:

1. A Diesel-electric locomotive for producing large power in a given length of locomotive comprising, in combination, a bed frame mounted upon driving wheels, and a plurality of individual power units each having a Diesel engine and an electric generator disposed at one end thereof, said power units being supported on top of said bed frame in relatively close side by side relation to each other with the engines disposed so that the crankshaft axis of each engine extends transversely of said bed frame thereby forming a longitudinally compact bank of transverse power units.

2. A Diesel-electric locomotive for producing large power in a given length of locomotive comprising, in combination, a bed frame mounted upon driving wheels and having an upper longitudinal supporting portion, and a plurality of individual self-contained power units each having a generally vertical type Diesel engine and an electric generator disposed at one end thereof, said power units being transversely disposed on said upper supporting portion in side by side relation to each other but spaced apart in a direction lengthwise of the frame so that the total space occupied by any two adjacent power units in a direction lengthwise of the frame is substantially less than the sum of the individual lengths of said units.

3. A Diesel-electric locomotive for producing large power in a given length of locomotive comprising, in combination, a bed frame mounted upon driving wheels and having an upper longitudinal supporting portion extending substantially across the width of said frame, a plurality of individual power units each having a generally vertical type Diesel engine and an electric generator disposed at one end thereof, said power units being transversely disposed on said upper supporting portion and extending substantially across the width of said frame in relatively close side by side relation to each other so as to form a longitudinally compact bank of transverse power units, the total space occupied by any two adjacent power units in a direction lengthwise of the frame being substantially less than the sum of the individual lengths of said units.

4. A Diesel-electric locomotive for producing large power in a given length of locomotive comprising, in combination, a bed frame mounted upon driving wheels, a plurality of individual power units each having a Diesel engine and an electric generator disposed at one end thereof, said power units being supported on top of said bed frame in relatively close side by side relation to each other with the engines disposed so that the crankshaft axis of each engine extends transversely of said bed frame thereby forming a longitudinally compact bank of transverse power units, and means for connecting said power units to said frame so that any unit may be relatively quickly individually removed or replaced by bodily moving the same in a plane which contains the engine axis and which extends at substantially right angles to the longitudinal axis of said bed frame.

5. A Diesel-electric locomotive for producing large power in a given length of locomotive comprising, in combination, a bed frame mounted upon driving wheels, and a plurality of substantially identical interchangeable power units each having a generally vertical type Diesel engine and an electric generator disposed at one end

thereof, said power units being mounted on the top of said frame in relatively close side by side relation to each other with the engines disposed so that the axis of each extends transversely of said bed frame thereby forming a longitudinally compact bank of transverse power units.

6. A Diesel-electric locomotive for producing large power in a given length of locomotive comprising, in combination, a bed frame mounted upon driving wheels and having an upper longitudinal supporting portion extending a substantial distance across the width of said frame, a plurality of individual power units each having a generally vertical type Diesel engine and an electric generator disposed at one end thereof, said power units being arranged with their longitudinal axes extending transversely of said frame and being supported on said upper frame portion in relatively close side by side parallel relation to each other so as to form a longitudinally compact bank of transverse power units, and means for connecting each engine and generator as a self-contained unit to said frame so that each such engine-generator unit may be individually bodily removed or replaced by moving the same in a plane containing the engine axis but extending at substantially right angles to the longitudinal axis of said bed frame.

7. A Diesel-electric locomotive for producing large power in a given length of locomotive comprising, in combination, a bed frame mounted upon driving wheels, a plurality of self-contained removable power units each having a generally vertical type Diesel engine and an electric generator disposed at one end thereof, said units being supported on the top of said frame transversely thereof and each unit also having a cooling radiator and an air circulating fan therefor formed as a unitary part of the unit so as to be removable therewith, and locomotive side and roof wall portions also formed as a unitary part of each power unit so as to be movable therewith during removal or replacement of a unit and said radiator being disposed so as to form at least a portion of said walls.

8. A Diesel-electric locomotive for producing large power in a given length of locomotive comprising, in combination, a bed frame mounted upon driving wheels, a plurality of individual power units each having a generally vertical type Diesel engine and an electric generator disposed at one end thereof, said power units being supported on the top of said frame in relatively close side by side relation to each other with the engines disposed so that the axis of each extends transversely of said bed frame thereby forming a longitudinally compact bank of transverse power units, and separate external locomotive wall portions for each successive unit and removable independently of each other but disposed in substantially contiguous relation to each other to form a longitudinally continuous enclosure for the bank of power units when in completely assembled relation.

9. A Diesel-electric locomotive for producing large power in a given length of locomotive comprising, in combination, a bed frame mounted upon driving wheels and having an upper longitudinal supporting portion effective for a substantial distance across said frame, and a plurality of individual power units each having a generally vertical type Diesel engine and an electric generator disposed at one end thereof, said power units being supported on said upper frame portion in relatively close side by side

relation to each other with the engines disposed so that the axis of each extends transversely of said bed frame thereby forming a longitudinally compact uniform bank of transverse power units, the engines of the respective units being located entirely at one side of the bed frame.

10. The combination set forth in claim 1 further characterized in that a cab is mounted on said bed frame at one end thereof and said power units are located on the bed frame starting at a point adjacent said cab, the cab and the power unit adjacent thereto being disposed in side by side relation to each other.

11. A Diesel-electric locomotive for producing large power in a given length of locomotive comprising, in combination, a bed frame mounted upon driving wheels and having a cab at each end, a supporting surface on the upper side of said frame extending a substantial distance across the width of said frame and extending continuously longitudinally between said cabs to provide a substantially unobstructed supporting surface, and a plurality of individual power units each having a generally vertical type Diesel engine and an electric generator disposed at one end thereof, said power units being arranged with their longitudinal axes extending transversely of said frame and being supported on said surface in relatively close side by side relation to each other from one cab to the other so as to form a continuous longitudinally compact bank of transverse power units.

12. The combination set forth in claim 1 further characterized by the provision of a longitudinally extending electrical compartment at one side of said bed frame in raised relation to the upper side thereof.

13. The combination set forth in claim 1 further characterized by the provision of a longitudinally extending compartment at one side of said frame in raised relation to said supporting surface and each of said power units having a radiator disposed over the top of said compartment.

14. The combination set forth in claim 1 further characterized by the provision of a longitudinally extending compartment at one side of said frame in raised relation to said supporting surface, each of said power units having a radiator disposed over the top of said compartment, and arms projecting from each power unit so as to overlie said compartment and support the radiators as a self-contained part of each power unit.

15. The combination set forth in claim 4 further characterized in that the means for removably connecting a unit includes means for bodily lifting an engine unit from the bed frame to effect disconnection of the engine therefrom.

16. The combination set forth in claim 4 further characterized in that the means for removably connecting a power unit includes means for bodily lifting the unit from the bed frame and thereafter allowing the unit to be moved laterally of the bed frame.

17. The combination set forth in claim 4 further characterized in that the means for removably connecting a unit includes means operable from one end of the power unit for disconnecting the same from the bed frame.

18. The combination set forth in claim 4 further characterized in that the means for removably connecting a unit includes rotatable means for bodily lifting an engine unit to disconnect the same from the bed frame.

19. The combination set forth in claim 4 further characterized in that the means for removably connecting a unit includes relatively vertically movable rollers disposed along each side of the power unit, and rotatable cams for imposing a lifting force on said rollers so as to lift a power unit free of the bed frame and thereby permit lateral movement of the power unit on said rollers during removal or replacement of the power unit.

20. A Diesel-electric locomotive for producing large power in a given length of locomotive comprising, in combination, a bed frame mounted upon driving wheels, a plurality of individual power units each having a generally vertical type Diesel engine provided with a crankshaft for driving an electric generator disposed at one end thereof, said power units being supported on the top of said frame in relatively close side by side relation to each other with the engines disposed so that their crankshaft axes extend transversely of said bed frame thereby forming a longitudinally compact uniform bank of transverse power units, and means forming separate roof sections, one section for each unit being formed as a unitary part thereof so as to be removable therewith, and said roof sections being disposed in substantially contiguous relation to each other to form an longitudinally continuous roof for the bank of power units when in completely assembled relation.

MAX ESSL.